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"पुराने को छोड नये के तरफ"
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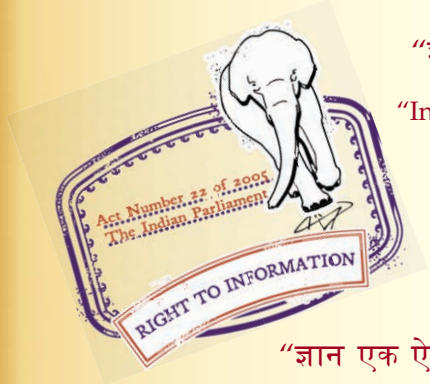
"Step Out From the Old to the New"

IS 7785-4-1 (1981): Elevated type aerodrome lighting fittings, Part 4: Angle of approach lights, Section 1: Visual approach slope indicators [ETD 24: Illumination Engineering and Luminaries]



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Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

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IS : 7785 (Part IV/Sec 1) - 1981

(Reaffirmed 2003)

Indian Standard

SPECIFICATION FOR ELEVATED TYPE AERODROME LIGHTING FITTINGS

PART IV ANGLE OF APPROACH LIGHTS

Section 1 Visual Approach Slope Indicators

UDC 628·971·8 : 656·71 : 625·736

INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

December 1981

Indian Standard

SPECIFICATION FOR ELEVATED TYPE AERODROME LIGHTING FITTINGS

PART IV ANGLE OF APPROACH LIGHTS

Section 1 Visual Approach Slope Indicators

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Indian Standard

SPECIFICATION FOR ELEVATED TYPE AERODROME LIGHTING FITTINGS

PART IV ANGLE OF APPROACH LIGHTS

Section 1 Visual Approach Slope Indicators

0. FOREWORD

0.1 This Indian Standard (Part IV/Sec 1) was adopted by the Indian Standards Institution on 18 March 1981, after the draft finalized by the Illuminating Engineering Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 This standard is intended to deal with specific requirements of visual approach slope indicators. A visual approach slope indictor system is provided to serve the approach to a runway whether or not the runway is served by other visual approach aids or by non-visual aids where one or more of the following conditions exist:

a) the runway is used by turbojet or other aeroplanes with similar approach guidance requirements;

b) the pilot of any type of aeroplane may have difficulty in judging the approach due to:

   i) inadequate visual guidance as is experienced during an approach over water or featureless terrain by day or the absence of sufficient extraneous lights in the approach area by night, or

   ii) misleading information such as is produced by deceptive surrounding terrain or runway slopes;

c) the presence of objects in the approach area may involve serious hazard if an aeroplane descends below the normal approach path, particularly if there are no non-visual or other visual aids to give warning of such objects;

d) physical conditions at either end of the runway present a serious hazard in the event of an aeroplane undershooting or overrunning the runway;

e) terrain or prevalent meteorological conditions are such that the aeroplane may be subjected to unusual turbulence during approach.

0.3 This standard (Part IV/Sec 1) is one of the series of Indian Standards on elevated type aerodrome lighting fittings. The other parts of the series so far published are as follows:

Part I General requirements,

Part II Fixed focus high intensity bi-directional runway edge lighting fittings, and

Part III Low intensity runway edge lighting fittings.

0.4 This standard shall be read in conjunction with IS : 7785 (Part I)-1975*.

0.5 In the preparation of this standard assistance has been derived from the following:

a) International Standards and Recommended Practices, Aerodromes Annex 14 (1976) Ed 7. International Civil Aviation Organization.

b) Aerodrome Design Manual; Part 4 Visual aids, first edition 1976. International Civil Aviation Organization.

c) BS : 3224 : Section C1 : 1963 : Lighting fittings for civil land aerodromes Part C. Angle of approach lights, Section C1. Visual approach slope indicators. British Standards Institution.

0.6 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960†. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard (Part IV/Sec 1) specifies the photometric performance and the essential mechanical and electrical features (other than lamps) of a visual approach slope indicator.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definition in addition to the definitions given in IS : 1885 (Part XVI/Sec 1)-1968‡ and IS : 1885 (Part XVI/Sec 2)-1968§ shall apply.

*Specification for elevated type aerodrome lighting fittings: Part I General requirements.

†Rules for rounding off numerical values (*revised*).

‡Electrotechnical vocabulary: Part XVI Lighting, Section 1 General aspects.

§Electrotechnical vocabulary: Part XVI Lighting, Section 2 General illumination lighting fittings and lighting for traffic and signalling.

2.1 Reference Plane — The highest plane below which no white light is emitted is called the reference plane of the indicators. Reference plane is also a plane of zero white intensity.

3. CONDITIONS OF USE

3.1 The indicator shall be suitable for use on ac or dc systems, with a voltage not greater than 50 V dc or ac (rms) to earth and shall be designed with more than one light source so that in the event of failure of one of the light sources in the indicator, it shall continue to give a correct indication to the pilot, albeit with reduced intensity.

3.2 Environmental Requirements — The equipment shall be designed for outdoor installation and continuous operation, and shall meet all specified requirements while operating under the following environmental conditions.

3.2.1 *Temperature* — A temperature range from − 20°C to + 55°C.

3.2.2 *Altitude* — Any altitude from sea level to 3 050 m above sea level.

3.2.3 *Humidity* — A humidity range from 10 percent to 95 percent at +55°C ambient temperature.

3.2.4 *Sand and Dust* — Exposure to airborne sand particles encountered on deserts or the result of air blast from jet aircraft.

3.2.5 *Salt Spray* — Exposure to a salt-laden atmosphere.

3.3 Care shall be taken in the design of the indicator to avoid the use of surfaces or components on which snow, ice, water, dust or blast effects from the jets can collect, which might give rise to a false signal from the indicator.

4. DETAILED REQUIREMENTS

4.1 Light Distribution

4.1.1 When equipped with lamps of light output and dimensions recommended by the manufacturer, the indicator shall emit a beam showing over a wide arc in azimuth in the approach direction and shall show white light in the upper portion of the beam and red light in the lower portion. The colour transition from red to white shall be such as to appear to an observer at a distance of about 305 m or more to occur over an angle in elevation of approximately 0·25 degree and not more than 0·5 degree.

4.1.2 This reference plane is readily used for setting up the indicator by observations made on the ground at a point about 30·5 m in front of the indicator and on its extended centre line. At this distance, the red and white light are readily distinguished and the disappearance of the white

light is immediately apparent. The pilot of an approaching aircraft sees only the resultant mixture of the white and red light, and the point at which the red apparently starts to change to pink is, for indicators in current use, about 0·125 degree above the reference plane.

4.1.3 The intensity of the completely red beam immediately below the transition sector shall be not less than 15 percent of the intensity of the completely white beam immediately above the transition sector.

NOTE — Approximate limits are specified because of the subjective element in observing the boundaries of the transition sector.

4.1.4 In one system high intensity beams of light are projected through a slot 5 cm deep which extends across the full width of the front face of the unit. To produce the required horizontal coverage a spreader glass is situated immediately in front of each lamp; ahead of this, but covering only the top half of the lamp aperture is a red glass filter. Alternatively, the red filter may form part of the spreader glass. The optical system is shown diagrammatically in Fig. 1 and is such that a fan shaped beam measuring approximately ± 12·5 degrees in azimuth and 7 degrees in elevation is emitted. Figure 2 shows typical beam characteristics. The top half of the beam is white and the lower half red. Between the red and white sectors of the beam there is a pink transition zone of up to approximately 0·25 degree.

4.1.5 The beam of light produced by the light units shall be such that in clear weather the effective visual range of the system shall be at least 7·4 km (4 NM) over the angle of 1·5° above and below the mean of the transition sector both by day and night and in azimuth over 10 degrees by day and 30 degrees by night.

NOTE — It may be an advantage to have a greater azimuth spread by night, provided this can be done without dazzling the pilot during approach and landing.

4.2 Uniformity — In any similar direction the intensity shall not vary by more than 3 : 2 from indicator to indicator within the same batch using the recommended lamps.

4.3 Colour — The colour of the red light emitted by the indicator shall be aviation red, as specified in **5.1** of IS : 7785 (Part I)-1975*.

4.4 Mounting — The indicator shall be provided with means for securing it to suitable supports.

NOTE — In order to maintain the accuracy of the signal from the indicator, attention is drawn to the necessity of providing a stable foundation and also to the requirements of **4.5** to **4.11.**

4.5 Frangibility — The design and construction shall be such that the indicator will collapse or disintegrate if struck by an aircraft and will cause the aircraft the least possible damage.

*Specification for elevated type aerodrome lighting fittings: Part I General requirements.

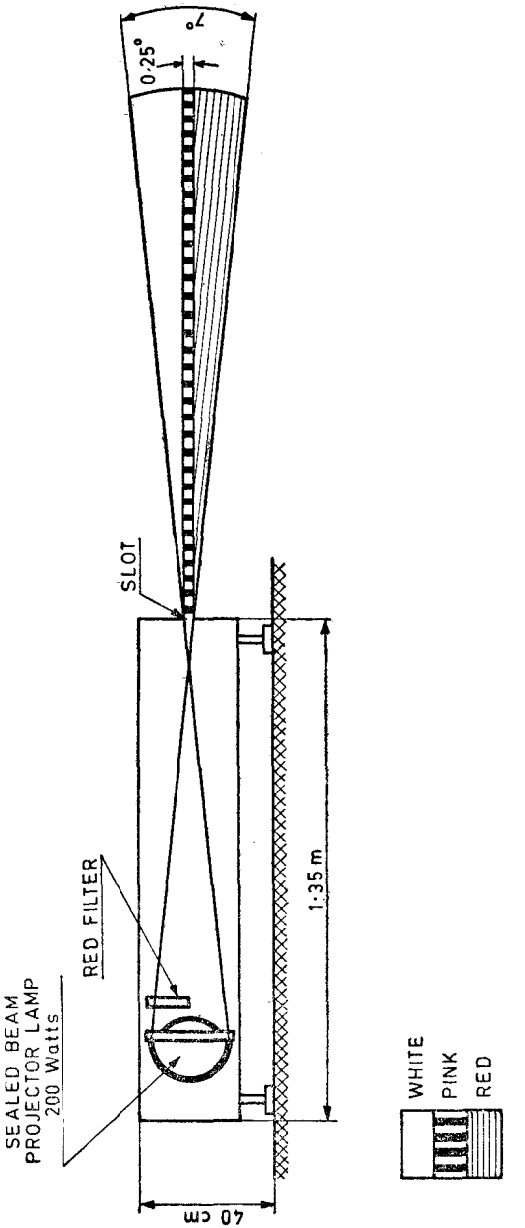
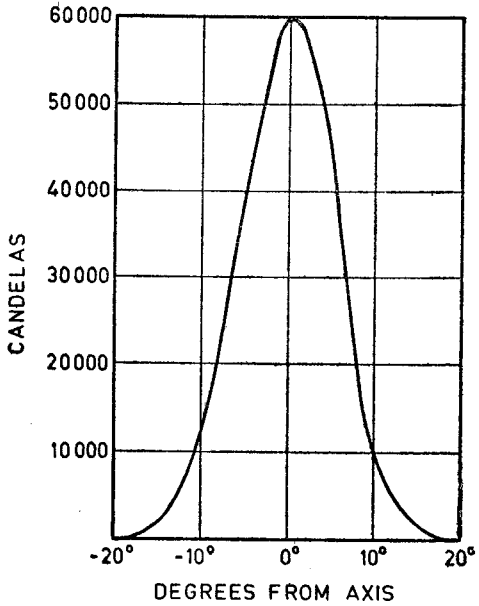
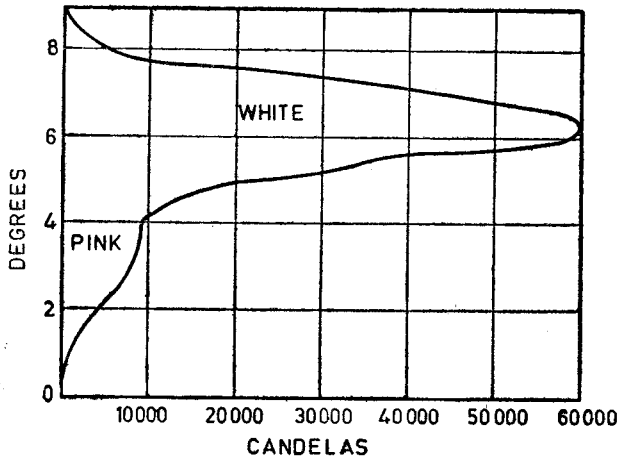


FIG. 1 VISUAL APPROACH SLOPE INDICATORS — TYPICAL OPTICAL SYSTEM (SLOT TYPE)



2A Horizontal Distribution



2B Vertical Distribution Across the Beam

FIG. 2 TYPICAL INTENSITY DISTRIBUTION OF VISUAL APPROACH SLOPE INDICATORS DESCRIBED IN **4.1.4**

4.6 Height — The overall height of the indicator shall not exceed 38 cm.

4.7 Weight — The weight of the indicator including lamps shall not exceed 50 kg.

4.8 Adjustment — Simple means of lockable adjustment shall be provided to enable the indicator to be rotated $\pm$ 2° in azimuth and to be levelled in all directions.

Simple means shall also be provided to permit variation of the angle of the reference plane between 1·5 degrees and 4·5 degrees above the horizontal plane in the direction of the beam, without resulting in any change in the level transverse to the beam.

Because of the importance of this elevation angle, the indicator and its mounting shall be designed to maintain the setting to within $\pm$2 minutes of arc.

4.9 Aiming Instrument Set

4.9.1 *Aiming Bar* — The aiming bar shall be an accurate alignment instrument that can be operated by one person. It shall be constructed of aluminium and shall be a light weight, rugged instrument designed to permit adjustment of the optical centre line of the lamp housing to the desired vertical angle. Design and construction shall be such that when the instrument is supported on the two surfaces, deviation from true position due to its own weight shall not exceed 3 minutes of arc. A dial shall be provided for setting the desired angle and shall indicate from 0 to 6 degrees in increments of 1 minute. The spacing between each degree mark shall be at least 1·0 cm. Alternative designs, using a vernier dial, may be used where provided with equivalent gradations as specified for the direct reading dial. The bar shall be so designed that repeated changes of the dial setting will not cause excessive wear and deterioration of the instrument's accuracy. Aluminium and other soft metals shall not be used where subjected to metal rubbing. The aiming bar shall utilize a 15 cm level having an accuracy of $\pm$ 2 minutes. The level shall be permanently mounted on the aiming bar to permit fine adjustment in calibrating the instrument. The level shall have a protective device to minimize possible damage. Operating instructions shall be permanently provided on the bar.

4.9.2 *Calibration Bar* — The calibration bar shall be constructed of aluminium of a shape, size, and thickness to provide a rigid and accurate checking instrument. The calibration bar shall be designed for lying on a flat surface or in the carrying case and shall have adjustment features to permit its being levelled to a horizontal plane. A level, attached to the bar, shall be provided with each calibration bar to permit levelling. The level shall be of the same type as used on the aiming bar (**4.9.1**). The calibration bar shall have devices comparable to the transition bar and aperture of

the lamp housing so that the aiming bar can be mounted thereon and accurately adjusted. Operating instructions shall be permanently provided on the bar.

4.10 Glasses and Transparent Parts — Glasses and colour filters shall be suitable for the temperatures to which they will be subjected under the conditions specified in 3 and **6.5.**

4.11 Fastening of Covers — Covers which require to be opened or removed for the adjustment of the indicator, lamp changing, etc, shall be secured by strong fastenings which are easily operated without the use of special tools. Fastenings and gaskets shall be captive and covers shall be suitable for opening or removal by one man.

4.12 Drainage — The indicator shall be so constructed that any rain or snow entering in it drains away without affecting the performance of the indicator.

4.13 Protection against Corrosion — All parts shall be adequately protected against corrosion and suitable precautions shall be taken to prevent electrochemical corrosion occurring between parts of different metals in contact.

4.14 Colour and External Finish — Vertical external surfaces facing down beam shall be matt black. All other external surfaces shall be finished in yellow colour (No. 355 of IS : 5-1978*).

4.15 Electrical Connections — Provision shall be made for the entry of a supply cable or cables and for clamping the cable or cables, to prevent strain and twisting of the ends of the conductors connected to the terminals.

4.16 Lamp Mounting — The lamp mounting shall be of sealed beam type. The focusing and the alignment of the lamps shall be fixed and it shall not be possible to alter them inadvertently during installation, when re-lamping, or performing other maintenance operations. The lamp mounting shall be designed for re-lamping without the use of any tools.

All materials used in the construction of the lamp mounting or the lampholder shall be capable of withstanding without deterioration the temperature reached under the most adverse operating conditions specified in 3 and with the recommended lamps.

4.17 Insulation — The insulation of current carrying parts shall be capable of passing the test specified in **6.8.**

Insulating materials shall be non-hygroscopic and capable of withstanding indefinitely without deterioration the temperatures reached under the operating conditions specified in **3.**

*Specification for colours for ready mixed paints and enamels (*third revision*).

5. MARKING

5.1 Information to be Marked — Each light indicator shall be suitably and clearly marked with the following information:

a) Manufacturer's name or trade-mark or both;

b) Model or type designation; and

c) Country of manufacture.

5.2 Method of Marking — Marking shall be legible and indelible and shall be made either on the indicator itself or on a name plate securely fixed thereto.

NOTE — The performance of marking is checked by inspection or by rubbing lightly with a piece of cloth, or by both methods.

5.3 A complete list of parts and installation and maintenance instructions shall be furnished with each indicator. Sufficient drawings or instructions shall be provided to indicate clearly the method of installation.

5.4 The indicators may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

6. TESTS

6.1 Classification of Tests

6.1.1 *Type Tests* — The following shall constitute the type tests:

a) Visual examination (*see* **6.2**),

b) Photometric and colorimetric test (*see* **6.3**),

c) Test for resistance to heat (*see* **6.4**),

d) Test for thermal shock (*see* **6.5**),

e) Test for temperature rise (*see* **6.6**),

f) Rain-proof test (*see* **6.7**),

g) Insulation resistance (dry) test (*see* **6.8**), and

h) High voltage test (*see* **6.9**).

6.1.1.1 For carrying out type tests the manufacturer shall submit to the testing authority three samples, preferably selected at random from regular production lots, together with relevant technical data as required.

6.1.1.2 *Criteria for approval* — The testing authority shall issue a type approval certificate, if the indicators are found to comply with the requirements of the test. In case of failure in any of the test, the testing authority shall call for fresh samples not exceeding twice the number of original samples and subject them to all the tests. If in the repeat tests, no failure occurs, the test may be considered to have been satisfied.

6.1.2 *Acceptance Tests* — The following shall constitute acceptance tests:

a) Visual examination (*see* **6.2**),

b) Rain-proof test (*see* **6.7**),

c) Insulation resistance (dry) test (*see* **6.8**), and

d) High voltage test (*see* **6.9**).

6.1.2.1 For carrying out acceptance tests, the sampling procedure and criteria of acceptance shall be subject to agreement between the supplier and the purchaser.

6.1.3 *Routine Tests* — The following shall constitute routine tests:

a) Visual examination (*see* **6.2**),

b) Insulation resistance (dry) test (*see* **6.8**), and

c) High voltage test (*see* **6.9**).

6.2 Visual Examination — Indicators shall not have any visible sign of damage. Compliance is checked by visual examination.

6.3 Photometric and Colorimetric Test

6.3.1 The indicator shall be tested in accordance with **5.8.2** of IS : 7785 (Part I)-1975* to determine whether it complies with the requirements of **4.1**, **4.2** and **4.3** when used with the recommended lamps at their rated current or voltage and when the values of intensity have been corrected to the nominal lamp lumens.

6.3.2 The readings for light distribution shall be made after the indicator has been operated at the rated current, or voltage, of the lamps for not less than 2 hours in an ambient temperature between 27° ± 2°C.

6.3.3 The indicator shall be tested for the light distribution requirements of **4.1** by taking readings at each 0·5 degree in elevation and 2·5 degrees in azimuth.

*Specification for elevated type aerodrome lighting fittings: Part I General requirements.

6.3.4 The indicator shall be tested for the chromaticity requirements given in **5.1** of IS : 7785 (Part I)-1975*.

NOTE 1 — The colorimetric test may be carried out with the filter separated from the indicator, provided suitable precautions are taken, and account is taken of the range of temperature specified in **3.2.**

NOTE 2 — For the tests specified in **4.2,** the same lamps may be used in several indicators.

6.4 Test for Resistance to Heat — The provisions of **5.8.3** of IS : 7785 (Part I)-1975* shall apply.

6.5 Test for Temperature Shock — The provisions of **5.8.4** of IS : 7785 (Part I)-1975* shall apply.

6.6 Test for Temperature Rise — The provisions of **5.8.5** of IS : 7785 (Part I)-1975* shall apply.

6.7 Rainproof Test — The provisions of **5.8.6** of IS : 7785 (Part I)-1975* shall apply.

6.8 Insulation Resistance (Dry) Test — The provisions of **5.8.7** of IS : 7785 (Part I)-1975* shall apply.

6.9 High Voltage Test — The provisions of **5.8.8** of IS : 7785 (Part I)-1975* shall apply.

*Specification for elevated type aerodrome lighting fittings: Part I General requirements.

INDIAN STANDARDS
ON
ILLUMINATING ENGINEERING

IS:

1777-1978 Industrial luminaire fittings with metal reflectors (*first revision*)
1885 (Part XVI/Sec 1)-1968 Electrotechnical vocabulary: Part XVI Lighting, Section 1 General aspects
1885 (Part XVI/Sec 2)-1968 Electrotechnical vocabulary: Part XVI Lighting, Section 2 General illumination, lighting fittings and lighting for traffic and signalling
1913 (Part I)-1978 General and safety requirements for luminaires: Part I Tubular fluorescent lamps (*second revision*)
1944 (Parts I & II)-1970 Code of practice for lighting of public thoroughfares (*first revision*)
1944 (Part V)-1981 Code of practice for lighting of public thoroughfares: Part V Lighting for grade separated junctions, bridges and elevated roads (Group D)
1944 (Part VII)-1981 Code of practice for lighting of public thoroughfares: Part VII Lighting for roads with special requirements (Group F)
1947-1980 Flood lights (*first revision*)
2149-1970 Luminaires for street lighting (*first revision*)
2206 (Part I)-1962 Flameproof electric lighting fittings: Part I Well-glass and bulkhead types
2206 (Part II)-1976 Flameproof electric lighting fittings: Part II Fittings using glass tubes
2493-1963 Well-glass lighting fittings for use underground in mines (non-flameproof type)
2672-1966 Code of practice for library lighting
3287-1965 Industrial lighting fittings with plastic reflectors
3528-1966 Waterproof electric lighting fittings
3553-1966 Watertight electric lighting fittings
3646 Code of practice for interior illumination:
(Part I)-1966 Principles of good lighting and aspects of design
(Part II)-1966 Schedule for values of illumination and glare index
(Part III)-1968 Calculation of coefficients of utilization by the BZ method
4012-1967 Dust-proof electric lighting fittings
4013-1967 Dust-tight electric lighting fittings
4347-1967 Code of practice for hospital lighting
5077-1969 Decorative lighting outfits
6585-1972 Screwless terminal and electrical connections for lighting fittings
6665-1972 Code of practice for industrial lighting
7537-1974 Road traffic signals
7569-1975 Cast acrylic sheets for use in luminaires
7678-1975 Method of photometric testing of incandescent type luminaires for general lighting service
7785 Elevated type aerodrome lighting fittings:
(Part I)-1975 General requirements
(Part II)-1976 Fixed focus high intensity bi-directional runway edge lighting fittings
(Part III)-1976 Low intensity runway edge lighting fittings
(Part IV/Sec 1)-1981 Angle of approach lights, Section 1 Visual approach slope indicators
(Part V/Sec 1)-1981 Approach lighting fittings, Section 1 High intensity elevated approach lighting fittings
8030-1976 Luminaires for hospitals
8224-1976 Electric lighting fittings for division 2 areas
9583-1981 Emergency lighting units

INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	*Unit*	*Symbol*
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	*Unit*	*Symbol*
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	*Unit*	*Symbol*	*Definition*
Force	newton	N	1 N =
Energy	joule	J	1 J =
Power	watt	W	1 W =
Flux	weber	Wb	1 Wb =
Flux density	tesla	T	1 T =
Frequency	hertz	Hz	1 Hz =
Electric conductance	siemens	S	1 S =
Electromotive force	volt	V	1 V =
Pressure, stress	pascal	Pa	1 Pa =

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